PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-190363

(43)Date of publication of application : 23.07.1996

(51)Int.Cl. G09G 3/28
G09G 3/20
G09G 3/36
G09G 5/10
H04N 5/20

(21)Application number : 07-018598

(22)Date of filing : 11.01.1995

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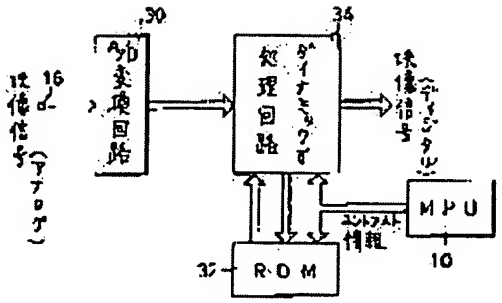
(54) VIDEO SIGNAL PROCESSING DEVICE

(57)Abstract:

PURPOSE: To improve the S/N ratio and to provide exact gamma correction in a dynamic gamma processing circuit by enlarging the dynamic range of the input signals of an A/D conversion circuit.

CONSTITUTION: In an image signal processing device which conducts the contrast adjustment of image signals and gamma correction using contrast information and the brightness information (e.g. APL) of image signals, the device is provided with a ROM 32 which previously stores the gamma correction data corresponding to the contrast information and the brightness information (APL). The corresponding gamma correction data is read from the ROM 32 using the contrast information and the brightness information of image signals as addresses and, using this gamma correction data, a dynamic gamma processing circuit 34 is installed to conduct contrast adjustment and gamma correction to unnecessitate analog contrast adjustment.



LEGAL STATUS

[Date of request for examination] 20.04.1999

[Date of sending the examiner's decision of rejection]	05.02.2002
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the video-signal processor (for example, video-signal processor for PDP (plasma display)) which carries out contrast adjustment and the gamma correction of a video signal using contrast information and the brightness information on a video signal.
[0002]
[Description of the Prior Art] Conventionally, this kind of video-signal processor was constituted as shown in drawing 4 R> 4. That is, if the contrast information (digital data) outputted from MPU (microprocessor unit)10 is changed into an analog signal by the D/A (digital/analog) conversion circuit 12 and inputs into the contrast equalization circuit 14, this contrast equalization circuit 14 will carry out contrast adjustment of the video signal (analog signal) inputted into the input terminal 16 using this contrast information.
[0003] The video signal outputted from the contrast equalization circuit 14 is changed into a video signal digital by the A/D (analog/digital) conversion circuit 18, and is inputted into the dynamic gamma processing circuit (only henceforth a dynamic gamma processing circuit) 20 which consisted of LSI (large-scale integrated circuit) etc.
[0004] This dynamic gamma processing circuit 20 read the gamma correction data which corresponded out of two or more gamma correction data (namely, gamma data point) beforehand memorized by ROM (read-only memory)22 using the digital video signal outputted from the A/D-conversion circuit 18, and the contrast information outputted from MPU10, carried out the gamma correction of a video signal using this read gamma correction data, and was outputting the digital video signal.
[0005]
[Problem(s) to be Solved by the Invention] however, in the conventional video-signal processor shown in drawing 4 Since it changes into a digital signal and he was trying to input subsequently to the dynamic gamma processing circuit 20 in the A/D-conversion circuit 18 after carrying out contrast processing of the video signal in analog in the contrast equalization circuit 14 The time of the contrast adjustment value of the contrast equalization circuit 14 being max will be corresponded when the channel range of the A/D-conversion circuit 18 is the maximum level. Usually, the maximum of the dynamic range of the input side of the A/D-conversion circuit 18 at the time (at the time [A contrast adjustment value is considered as whenever / middle /. usually]) was controlled (controlled by original one half extent), and there was a trouble that a S/N ratio worsened.
[0006] Moreover, since the contrast information supplied to the dynamic gamma processing circuit 20 to the contrast information supplied to the contrast equalization circuit 14 being analog data was digital data, the error arose among both data and there was a trouble that exact gamma correction processing could not be performed in the dynamic gamma processing circuit 20. For this reason, in the case of the multi-vision which has arranged two or more displays to juxtaposition, the trouble that a difference will arise was in two or more brightness and color tones of each display image of a display.
[0007] It aims at offering the video-signal processor which this invention was made in view of the

above-mentioned trouble, can enlarge the dynamic range of the input signal of an A/D-conversion circuit which changes the video signal of an analog into a digital video signal, and can improve a S/N ratio, and can perform more correctly gamma correction processing in a dynamic gamma processing circuit.

[0008]

[Means for Solving the Problem] In the video-signal processor with which invention of claim 1 carries out contrast adjustment and the gamma correction of said video signal using contrast information and the brightness information on a video signal ROM which memorized beforehand the gamma correction data corresponding to said contrast information and the brightness information on said video signal, The data read-out means which reads the gamma correction data which corresponded from said ROM by making said contrast information and brightness information on said video signal into the address, It is characterized by coming to provide the dynamic gamma processing circuit which carries out contrast adjustment and the gamma correction of said video signal using the gamma correction data read with this data read-out means.

[0009] Invention of claim 2 comes to read the gamma correction data which made contrast information the high-order-digit address for the data read-out means, and corresponded from ROM by making brightness information on a video signal into the low order digit address in invention of claim 1.

[0010] Invention of claim 3 comes to read the gamma correction data which made brightness information on a video signal the high-order-digit address for the data read-out means, and corresponded from ROM by making contrast information into the low order digit address in invention of claim 1.

[0011]

[Function] A data read-out means makes the address contrast information based on the directions from a user etc., and brightness information on a video signal (for example, APL (average picture level)), invention of claim 1 reads the gamma correction data which corresponded from ROM, and a dynamic gamma processing circuit carries out contrast adjustment and the gamma correction of a video signal using the gamma correction data read with the data read-out means.

[0012] Invention of claim 2 reads the gamma correction data with which the data read-out means made contrast information the high-order-digit address, and corresponded from ROM by making brightness information on a video signal (for example, APL) into the low order digit address in invention of claim 1. For example, one group in two or more gamma correction curvilinear groups for contrast information is chosen, and one of two or more gamma correction curves contained in the one group is chosen by APL of a video signal.

[0013] Invention of claim 3 reads the gamma correction data with which the data read-out means made brightness information on a video signal (for example, APL) the high-order-digit address, and corresponded from ROM by making contrast information into the low order digit address in invention of claim 1. For example, one group in two or more gamma correction curvilinear groups by APL of a video signal is chosen, and one of two or more gamma correction curves contained in the one group is chosen for contrast information.

[0014]

[Example] One example of the video-signal processor by this invention is explained using drawing 1 and drawing 2 . In drawing 1 , 10 is MPU, 16 is an input terminal, and the A/D-conversion circuit 30 has combined with this input terminal 16. 32 is ROM (read-only memory) and the gamma correction (that is, contrast adjustment was considered) data corresponding to contrast information and the brightness information on a video signal (APL (average picture level)) are beforehand memorized by this ROM32.

[0015] The gamma correction data beforehand memorized by said ROM32 are data which one on the gamma correction curves gamma1, gamma2, and gamma3 of drawing 2 and the gamma correction curve (for example, gamma 2) of -- which one was chosen and was chosen with the upper address by making brightness information on a video signal into a lower address is chosen by making for example, contrast information into an upper address, and are obtained. Said gamma correction curves gamma1, gamma2, and gamma3 and -- are formed so that a figure (it is 2 about gamma 2) becomes large, the inclination of an output/input may become small and contrast may fall.

[0016] 34 is the dynamic gamma processing circuit which consisted of LSI (large-scale integrated circuit) etc., and this dynamic gamma processing circuit 34 is constituted so that the gamma correction which considered contrast adjustment may be carried out, while constituting a data read-out means in cooperation with said MPU10.
[0017] Namely, said dynamic gamma processing circuit 34 Based on the digital video signal to output, APL (average picture level) is detected from said A/D-conversion circuit 30. The gamma correction data which corresponded from said ROM32 by making contrast information from said MPU10 into the high-order-digit address while making this APL into the low order digit address are read. While carrying out contrast adjustment of the video signal outputted from said A/D-conversion circuit 30 using this read gamma correction data, it is constituted so that a gamma correction may be carried out.
[0018] Below, an operation of the example of drawing 1 is used together and drawing 2 is explained.
(b) The video signal of an analog inputted into the input terminal 16 is changed into a digital video signal by the A/D-conversion circuit 30, and input it into the dynamic gamma processing circuit 34 by it. Moreover, based on the command from the user using an input means (illustration is omitted) etc., contrast information outputs from MPU10.
[0019] (b) The dynamic gamma processing circuit 34 detects APL based on the digital video signal first inputted from the A/D-conversion circuit 30, and outputs it to ROM32 by making this APL into the low order digit address. The contrast information from MPU10 has inputted into this ROM32 as the high-order-digit address.
[0020] For this reason, the dynamic gamma processing circuit 34 reads the gamma correction data (for example, data with which it corresponded on the gamma correction curve gamma 2 of drawing 2) which made contrast information the low order digit address, and corresponded the high-order-digit address and APL contrast information from ROM32 in it, carries out contrast adjustment and the gamma correction of a video signal using this read gamma correction data, and outputs that digital video signal that carried out signal processing.
[0021] Although the gamma correction curves gamma1, gamma2, and gamma3 and -- were formed in said example so that the figure became large, an inclination might become small and contrast might fall, this invention is not restricted to this. For example, as shown in drawing 3 , the gamma correction curves gamma1, gamma2, and gamma3 and -- may be formed so that a figure becomes large, the amount of parallel displacements from the datum line to the right may be enlarged and contrast may fall.
[0022] Although the gamma correction data which the data read-out means made contrast information the high-order-digit address, and corresponded from ROM by making brightness information on a video signal (for example, APL) into the low order digit address were read in said example, this invention should just read the gamma correction data which restrict to this and corresponded from ROM by making **, contrast information, and brightness information on a video signal into the address.
[0023] For example, you may make it a data read-out means read the gamma correction data which made brightness information on a video signal the high-order-digit address, and corresponded from ROM by making contrast information into the low order digit address.
[0024]
[Effect of the Invention] Invention of claim 1 as mentioned above Contrast information and the brightness information on a video signal ROM which memorized beforehand the gamma correction data corresponding to (for example, APL) is prepared. Since the gamma correction data which corresponded from ROM by making contrast information and brightness information on a video signal into the address are read and it was made to carry out contrast adjustment and the gamma correction of a video signal using this read gamma correction data Since the dynamic range of the input signal of an A/D-conversion circuit which changes the video signal of an analog into a digital video signal can be enlarged as much as possible and it is not necessary to control it like the conventional example, The dynamic range of the input signal of an A/D-conversion circuit can be enlarged, and a S/N ratio can be improved.
[0025] And since it was made to perform the contrast adjustment and the gamma correction in a dynamic gamma processing circuit for digital contrast information and the brightness information on a video signal (for example, APL), gamma correction processing more exact than the conventional

example which was performing contrast adjustment by analog processing can be performed. For this reason, in the case of a multi-vision, the brightness of the display image of two or more displays and the difference in a color tone can be made small.

[0026] In invention of claim 1, since invention of claim 2 was constituted so that the gamma correction data with which the data read-out means made contrast information the high-order-digit address, and corresponded from ROM by making brightness information on a video signal into the low order digit address might be read, it can simplify the configuration of a data read-out means.

[0027] In invention of claim 1, since invention of claim 3 read the data of a gamma correction curve with which the data read-out means made brightness information on a video signal the high-order-digit address, and corresponded from ROM by making contrast information into the low order digit address, it can simplify the configuration of a data read-out means.

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TECHNICAL FIELD

[Industrial Application] This invention relates to the video-signal processor (for example, video-signal processor for PDP (plasma display)) which carries out contrast adjustment and the gamma correction of a video signal using contrast information and the brightness information on a video signal.

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PRIOR ART

[Description of the Prior Art] Conventionally, this kind of video-signal processor was constituted as shown in drawing 4 R> 4. That is, if the contrast information (digital data) outputted from MPU (microprocessor unit)10 is changed into an analog signal by the D/A (digital/analog) conversion circuit 12 and inputs into the contrast equalization circuit 14, this contrast equalization circuit 14 will carry out contrast adjustment of the video signal (analog signal) inputted into the input terminal 16 using this contrast information.
[0003] The video signal outputted from the contrast equalization circuit 14 is changed into a video signal digital by the A/D (analog/digital) conversion circuit 18, and is inputted into the dynamic gamma processing circuit (only henceforth a dynamic gamma processing circuit) 20 which consisted of LSI (large-scale integrated circuit) etc.
[0004] This dynamic gamma processing circuit 20 read the gamma correction data which corresponded out of two or more gamma correction data (namely, gamma data point) beforehand memorized by ROM (read-only memory)22 using the digital video signal outputted from the A/D-conversion circuit 18, and the contrast information outputted from MPU10, carried out the gamma correction of a video signal using this read gamma correction data, and was outputting the digital video signal.

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EFFECT OF THE INVENTION

[Effect of the Invention] Invention of claim 1 as mentioned above Contrast information and the brightness information on a video signal ROM which memorized beforehand the gamma correction data corresponding to (for example, APL) is prepared. Since the gamma correction data which corresponded from ROM by making contrast information and brightness information on a video signal into the address are read and it was made to carry out contrast adjustment and the gamma correction of a video signal using this read gamma correction data Since the dynamic range of the input signal of an A/D-conversion circuit which changes the video signal of an analog into a digital video signal can be enlarged as much as possible and it is not necessary to control it like the conventional example, The dynamic range of the input signal of an A/D-conversion circuit can be enlarged, and a S/N ratio can be improved.
[0025] And since it was made to perform the contrast adjustment and the gamma correction in a dynamic gamma processing circuit for digital contrast information and the brightness information on a video signal (for example, APL), gamma correction processing more exact than the conventional example which was performing contrast adjustment by analog processing can be performed. For this reason, in the case of a multi-vision, the brightness of the display image of two or more displays and the difference in a color tone can be made small.
[0026] In invention of claim 1, since invention of claim 2 was constituted so that the gamma correction data with which the data read-out means made contrast information the high-order-digit address, and corresponded from ROM by making brightness information on a video signal into the low order digit address might be read, it can simplify the configuration of a data read-out means.
[0027] In invention of claim 1, since invention of claim 3 read the data of a gamma correction curve with which the data read-out means made brightness information on a video signal the high-order-digit address, and corresponded from ROM by making contrast information into the low order digit address, it can simplify the configuration of a data read-out means.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, in the conventional video-signal processor shown in drawing 4 Since it changes into a digital signal and he was trying to input subsequently to the dynamic gamma processing circuit 20 in the A/D-conversion circuit 18 after carrying out contrast processing of the video signal in analog in the contrast equalization circuit 14 The time of the contrast adjustment value of the contrast equalization circuit 14 being max will be corresponded when the channel range of the A/D-conversion circuit 18 is the maximum level. Usually, the maximum of the dynamic range of the input side of the A/D-conversion circuit 18 at the time (at the time [A contrast adjustment value is considered as whenever / middle /. usually]) was controlled (controlled by original one half extent), and there was a trouble that a S/N ratio worsened.
[0006] Moreover, since the contrast information supplied to the dynamic gamma processing circuit 20 to the contrast information supplied to the contrast equalization circuit 14 being analog data was digital data, the error arose among both data and there was a trouble that exact gamma correction processing could not be performed in the dynamic gamma processing circuit 20. For this reason, in the case of the multi-vision which has arranged two or more displays to juxtaposition, the trouble that a difference will arise was in two or more brightness and color tones of each display image of a display.
[0007] It aims at offering the video-signal processor which this invention was made in view of the above-mentioned trouble, can enlarge the dynamic range of the input signal of an A/D-conversion circuit which changes the video signal of an analog into a digital video signal, and can improve a S/N ratio, and can perform more correctly gamma correction processing in a dynamic gamma processing circuit.

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OPERATION

[Function] A data read-out means makes the address contrast information based on the directions from a user etc., and brightness information on a video signal (for example, APL (average picture level)), invention of claim 1 reads the gamma correction data which corresponded from ROM, and a dynamic gamma processing circuit carries out contrast adjustment and the gamma correction of a video signal using the gamma correction data read with the data read-out means.
[0012] Invention of claim 2 reads the gamma correction data with which the data read-out means made contrast information the high-order-digit address, and corresponded from ROM by making brightness information on a video signal (for example, APL) into the low order digit address in invention of claim 1. For example, one group in two or more gamma correction curvilinear groups for contrast information is chosen, and one of two or more gamma correction curves contained in the one group is chosen by APL of a video signal.
[0013] Invention of claim 3 reads the gamma correction data with which the data read-out means made brightness information on a video signal (for example, APL) the high-order-digit address, and corresponded from ROM by making contrast information into the low order digit address in invention of claim 1. For example, one group in two or more gamma correction curvilinear groups by APL of a video signal is chosen, and one of two or more gamma correction curves contained in the one group is chosen for contrast information.

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MEANS

[Means for Solving the Problem] In the video-signal processor with which invention of claim 1 carries out contrast adjustment and the gamma correction of said video signal using contrast information and the brightness information on a video signal ROM which memorized beforehand the gamma correction data corresponding to said contrast information and the brightness information on said video signal, The data read-out means which reads the gamma correction data which corresponded from said ROM by making said contrast information and brightness information on said video signal into the address, It is characterized by coming to provide the dynamic gamma processing circuit which carries out contrast adjustment and the gamma correction of said video signal using the gamma correction data read with this data read-out means.
[0009] Invention of claim 2 comes to read the gamma correction data which made contrast information the high-order-digit address for the data read-out means, and corresponded from ROM by making brightness information on a video signal into the low order digit address in invention of claim 1.
[0010] Invention of claim 3 comes to read the gamma correction data which made brightness information on a video signal the high-order-digit address for the data read-out means, and corresponded from ROM by making contrast information into the low order digit address in invention of claim 1.

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EXAMPLE

[Example] One example of the video-signal processor by this invention is explained using drawing 1 and drawing 2 . In drawing 1 , 10 is MPU, 16 is an input terminal, and the A/D-conversion circuit 30 has combined with this input terminal 16. 32 is ROM (read-only memory) and the gamma correction (that is, contrast adjustment was considered) data corresponding to contrast information and the brightness information on a video signal (APL (average picture level)) are beforehand memorized by this ROM32.
[0015] The gamma correction data beforehand memorized by said ROM32 are data which one on the gamma correction curves gamma1, gamma2, and gamma3 of drawing 2 and the gamma correction curve (for example, gamma 2) of -- which one was chosen and was chosen with the upper address by making brightness information on a video signal into a lower address is chosen by making for example, contrast information into an upper address, and are obtained. Said gamma correction curves gamma1, gamma2, and gamma3 and -- are formed so that a figure (it is 2 about gamma 2) becomes large, the inclination of an output/input may become small and contrast may fall.
[0016] 34 is the dynamic gamma processing circuit which consisted of LSI (large-scale integrated circuit) etc., and this dynamic gamma processing circuit 34 is constituted so that the gamma correction which considered contrast adjustment may be carried out, while constituting a data read-out means in cooperation with said MPU10.
[0017] Namely, said dynamic gamma processing circuit 34 Based on the digital video signal to output, APL (average picture level) is detected from said A/D-conversion circuit 30. The gamma correction data which corresponded from said ROM32 by making contrast information from said MPU10 into the high-order-digit address while making this APL into the low order digit address are read. While carrying out contrast adjustment of the video signal outputted from said A/D-conversion circuit 30 using this read gamma correction data, it is constituted so that a gamma correction may be carried out.
[0018] Below, an operation of the example of drawing 1 is used together and drawing 2 is explained.
(b) The video signal of an analog inputted into the input terminal 16 is changed into a digital video signal by the A/D-conversion circuit 30, and input it into the dynamic gamma processing circuit 34 by it. Moreover, based on the command from the user using an input means (illustration is omitted) etc., contrast information outputs from MPU10.
[0019] (b) The dynamic gamma processing circuit 34 detects APL based on the digital video signal first inputted from the A/D-conversion circuit 30, and outputs it to ROM32 by making this APL into the low order digit address. The contrast information from MPU10 has inputted into this ROM32 as the high-order-digit address.
[0020] For this reason, the dynamic gamma processing circuit 34 reads the gamma correction data (for example, data with which it corresponded on the gamma correction curve gamma 2 of drawing 2) which made contrast information the low order digit address, and corresponded the high-order-digit address and APL contrast information from ROM32 in it, carries out contrast adjustment and the gamma correction of a video signal using this read gamma correction data, and outputs that digital video signal that carried out signal processing.
[0021] Although the gamma correction curves gamma1, gamma2, and gamma3 and -- were formed in

said example so that the figure became large, an inclination might become small and contrast might fall, this invention is not restricted to this. For example, as shown in drawing 3 , the gamma correction curves gamma1, gamma2, and gamma3 and -- may be formed so that a figure becomes large, the amount of parallel displacements from the datum line to the right may be enlarged and contrast may fall.
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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing one example of the video-signal processor by this invention.
[Drawing 2] It is the property Fig. which expresses with ROM of drawing 1 a part of gamma correction curve corresponding to the gamma correction data memorized beforehand.
[Drawing 3] It is the property Fig. in other examples which expresses with ROM a part of gamma correction curve corresponding to the gamma correction data memorized beforehand.
[Drawing 4] It is the block diagram showing the conventional example.
[Description of Notations]
10 -- MPU (microprocessor unit), 16 -- Input terminal 30 [34 -- A dynamic gamma (gamma) processing circuit, gamma1-gamma3 -- Gamma correction curve.] -- An A/D-conversion circuit, 32 -- ROM

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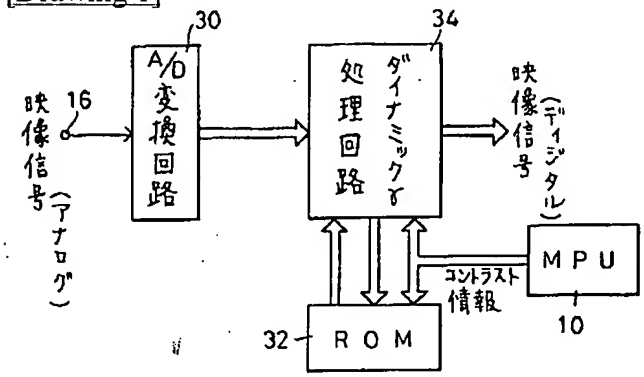
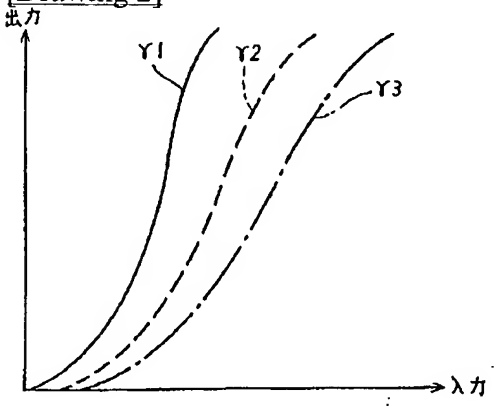
DRAWINGS

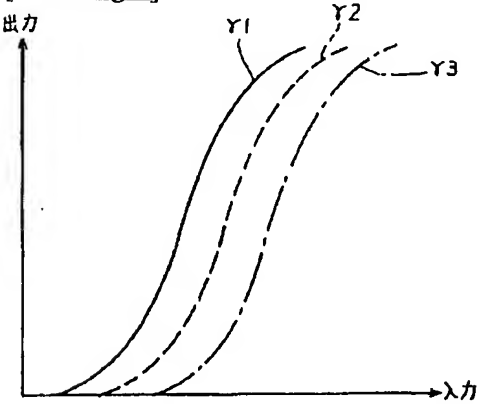
[Drawing 1]



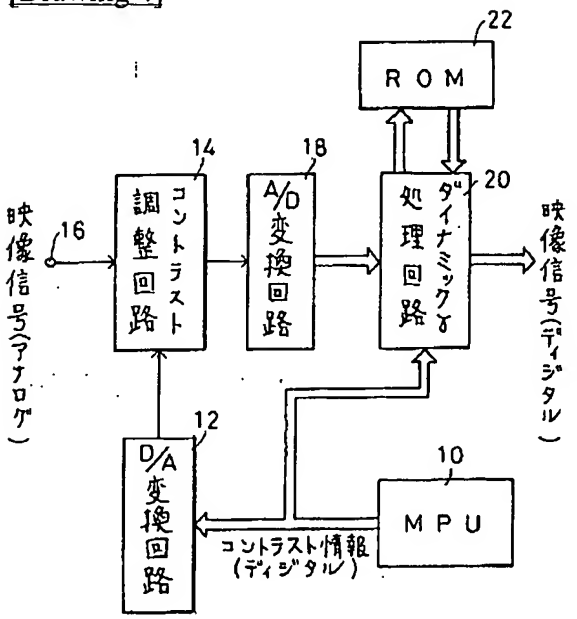
[Drawing 2]



[Drawing 3]



[Drawing 4]



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